الجمهورية الجزائرية الديمقراطية الشعبية
People's Democratic and Republic of Algeria

Ministry of Higher Education and Scientific Research

National School of Cyber Security

NSCS
المدرسة الوطنية العليا في الأمن السيبراني
NATIONAL SCHOOL OF CYBERSECURITY

وزارة التعليم العالي والبحث العلمي

المدرسة الوطنية العليا في الأمن السيبراني

Algorithms and Static data structures

Serie of exercises 4

December 2024

Exercise 1: Solving Quadratic Equations

Solve a quadratic equation $ax^2+bx+c=0$ using the quadratic formula

Exercise 2 Rearranging Digits in Ascending Order

Write a program that takes an integer N (positive or negative) and rearranges its digits to form the largest possible number using the same digits. The sign of N must be preserved.

Examples:

- N=5961N=5961 → Result: 9651
- N=−18→ Result: -81
- N=723859 → Result: 987532
- N=−5043 → Result: -5430
- N=0→ Result: 0

Exercise 3: Extracting Even and Odd Digits from an Integer

Given an integer N, we want to generate two other integers, N1 and N2.

- The first integer (N1) will consist of the even digits of N.
- The second integer (N2) will consist of the odd digits of N.

Examples:

1. For N = 25461327, N1 = 2462, N2 = 5137
2. For N = 42613786, N1 = 42686, N2 = 137
3. For N = 240682, N1 = 240682, N2 = 0
4. For N = 103, N1 = 0, N2 = 13

Exercise 4:

Given a positive integer N, you need to calculate two values:

1. **Product of all prime digits** in N.
2. **Sum of all non-prime digits** in N.

Prime digits are: 2, 3, 5, 7.
Non-prime digits are: 0, 1, 4, 6, 8, 9.

For example:

- For N = 2357:
  - Prime digits: 2, 3, 5, 7 → Product = 2 * 3 * 5 * 7 = 210
  - Non-prime digits: There are no non-prime digits → Sum = 0
- For N = 123456789:
  - Prime digits: 2, 3, 5, 7 → Product = 2 * 3 * 5 * 7 = 210
  - Non-prime digits: 1, 4, 6, 8, 9 → Sum = 1 + 4 + 6 + 8 + 9 = 28

Exercise 5: Reversing the Digits Based on Divisibility Rules

Given a positive integer N, the task is to reverse the digits of N based on the following divisibility rules:

1. If a digit is **divisible by 3**, reverse its position to the left three steps..
2. If a digit is **divisible by 2 but not by 3**, leave it in its original position.
3. If a digit is **not divisible by 2 or 3**, replace it with the digit 0.

After applying these rules, you should print the modified number.

Example :

- **Input**: 123456
- **Output**: 320654

Exercise 6: Reversing and Cleaning Digits of an Integer

Write a program to reverse the digits of an integer N (positive or negative) **and remove any trailing zeroes** in the reversed number.

Examples:

- N=59610 → Result: 1956
- N=−20400 → Result: -402
- N=7000 → Result: 7
- N=−9 → Result: -9

- N=12345 → Result: 54321
- N=0 → Result: 0